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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN AND RELATING TO WRITING INSTRUMENTS

(71) We, NIKKO PEN KABUSHIKI KAISHA, a corporation organized and existing under the laws of Japan, having its principal place of business of 425 Kamifudamachi, Chofu City, Tokyo, Japan, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to writing instruments of the kind wherein two or more writing elements, such as ball-point pen cartridges or refills, are accommodated in a holder and each element is movable between a withdrawn position, where its writing tip is disposed within the holder, and a writing position, where its writing tip protrudes from the holder, thereby permitting of selection of the element used in writing with the instruments. Said writing instruments are referred to hereinafter as "writing instruments of the kind referred to" and generally, but not necessarily, these writing instruments incorporate writing elements of different colours.

Conventionally, writing instruments of the kind referred to have been constructed with separate operating members for each writing element, which operating members are independently slidable with respect to the holder to move the respective writing element between its withdrawn and writing positions, or with a rotor for moving each writing element in turn from its withdrawn position to a position where a single operating member, which can be slidable or rotatable with respect to the holder, can be operated to move the selected writing element into and out of its writing position. However, a writing instrument of the kind referred to has not previously been constructed where repeated depression of a single operating member, which is slidable with respect to the holder, causes the writing elements to be presented in turn at their writing positions.

According to the present invention, there is

[Price 25p]

provided a writing instrument of the kind referred to including a rotor rotatably received in the holder and having a first cam surface with a profile defining, for each revolution of the rotor, a number of steps at least equal to the number of writing elements, and a second cam surface for moving, during each revolution of the rotor, the writing elements in sequence from their withdrawn to their writing elements into their withdrawn possibly received in the holder to engage the first cam surface to rotate the rotor; means biasing the operating member away from the first cam surface; and means biasing the writing elements into their withdrawn positions, the arrangement being such that successive depressions of the operating member will cause the writing elements to be represented sequentially at their writing positions.

The holder of writing instruments in accordance with the present invention usually will be elongate and essentially tubular having one end, i.e. the lower end, thereof an orifice through which the writing tip of each writing element will extend when said element is in its writing position. The rotor may be a cylindrical tube and the first cam surface may be formed radially on an inner surface of an upper portion thereof. Such a first cam surface may be formed of a number of surface portions inclined to the axial direction with the lowermost point of each portion disposed axially above the uppermost point of the next portion. Said points may be joined by axially extending surfaces thereby rendering the first cam surface continuous.

The operating member preferably extends through an orifice in the holder and is movable axially with respect thereto. This operating member may have a radially projecting rib section which extends axially to engage at its lower end the first cam surface. Preferably, this lower end is inclined to increase the area of contact with the first cam surface.

The second cam surface may be the axially lower surface of an annular projection de-

pending from the rotor body. This cam surface may be formed essentially of a first surface portion inclined to the axial direction and a second surface portion contained in the radial plane passing through the uppermost point of the first surface portion. A notch formed of an upwardly convergent pair of surfaces may be formed adjacent to the lowermost point on the first surface portion to positively locate a writing element in its writing position. The inclined surface contiguous the first surface portion advantageously is arranged to cause the rotor to rotate slightly on release of the operating member from engagement with the first cam surface so that subsequent engagement of the operating member with the first cam surface will occur at a point on the first cam surface in advance of the point of previous disengagement of said member with said cam surface.

The writing elements may each be provided at their upper ends with a cap having a portion thereof constituting a follower for the second cam surface. Said follower portion may be constituted by a radially projecting rib extending axially of the cap body and having a pointed upper end for engagement with the second cam surface. An inset member having bores therein to locate the writing elements may be fixedly provided in the holder and said inset member may also have grooves in which the ribs of the caps are slidably received to prevent rotation of said caps.

The following is a description by way of example only with reference to the accompanying drawings of a two-colour ball-point pen in accordance with the present invention.

Figure 1 is a longitudinal cross-section of a two colour ball-point pen in accordance with the present invention;

Figure 2A is an elevation of the operating member of the pen of Figure 1;

Figure 2B is a view of the operating member taken from the right hand side of Figure 2A;

Figure 2C is a plan view of the operating member of Figures 2A and 2B;

Figure 3A is an elevation of the rotor of the pen of Figure 1;

Figure 3B is a view of the rotor taken from the left hand side of Figure 3A;

Figure 3C is a view of the rotor taken from the rear of Figure 3A; and

Figure 3D is a developed view of the internal cam surface of the rotor of Figures 3A to C;

Figure 4A is an elevation (partially in longitudinal section) of an ink reservoir cap of the pen of Figure 1;

Figure 4B is a view of the cap taken from the left hand side of Figure 4A;

Figure 5 is an elevation of an inset member of the pen of Figure 1;

Figure 6A is a side view of the rotor and

the upper part of the inset member when both ink reservoirs are in their withdrawn positions;

Figure 6B is a view of the rear of Figure 6A;

Figure 7A is a view corresponding to Figure 6A showing the rotor moved through approximately 180° to retain an ink reservoir in its writing position;

Figure 7B is a view taken from the rear of Figure 7A;

Figures 8 and 9 are diagrammatic representations of the manner in which an ink reservoir is retained in its writing position.

A two-colour ball point pen in accordance with the present invention comprises a hollow generally tubular pen holder 1 open at its upper and lower ends and formed of upper and lower body portions 1a and 1b, respectively, joined together by co-operating screw threaded portions at their respective lower and upper ends. An inset member 2 is fixedly supported within the pen holder by the upper end of the lower body portion 1b. This inset member 2 is formed of four right-cylindrical portions 2e, f, g and h of different diameters arranged co-axially so that the diameter of the inset member increases step-wise in the axially downwards direction. Two bores 2a extend parallel to the axis of the pen through the first member portions 2e, f and g at points spaced diametrically apart, the bores being of reduced diameter at a lower portion on which the shoulder 2C is defined for engagement with a coil spring. A pair of guide grooves 2b extend through the intermediate portions 2f and 2g of the inset member to communicate one with each of the bores 2a.

An ink reservoir 4 is accommodated in each of the bores 2a with its writing tip lowermost and has fixedly attached at its upper end a cap 5 slidably received in the upper end of the bore 2a. A coil spring 3 is disposed about the ink reservoir and acts between the shoulder 2c and the lower end of the cap 5 to bias the ink reservoir upwardly. The cap 5 has a radially projecting and axially extending rib 5a which is slidably received in the guide groove 2b to prevent rotational movement of the cap and ink reservoir whilst permitting axial movement thereof. The top of the rib 5a is formed as an upwardly directed point 5b.

A rotor 6 is rotatably accommodated in the holder 1 immediately above the inset member 2 and has a tubular cylindrical upper body portion 6a. The radially inner surface of said upper body portion is configured to constitute a first cam surface comprising a pair of upwardly facing surface portions 6b inclined at approximately 45° to the axial direction and arranged with the upper point of each portion disposed immediately above the lower point of the other portion. A pair of

vertical faces join the respective upper and lower surfaces to complete the first cam surface. The base of the upper body portion 6a is formed with an annular flange which extends radially both inwardly and outwardly of the wall defining the said portion. An arcuate lower portion 6c depends from the circumferentially outer part of the flange and extends over approximately half said circumference. The edges of said lower portion 6c are formed of a first edge surface 6e inclined to the axial direction and continued at its lowermost end in a short upwardly directed edge surface 6f, which together with another short inclined surface 6g defines a notch for receiving and locating the pointed upper end 5b of the cap 5. An axially extending edge surface 6h joins the lowermost part of surface 6g with the annular flange. The said edge surfaces 6e to 6h together with the planar lower surface of the flange joining the upper ends of edge surfaces 6e and 6h constitute a second cam surface.

The rotor is located in the holder 1 by a shoulder in the upper part of the pen holder which co-operates with the radially outer part of the flange and by location of the upper portion 2h of the inset member 2 within the curved lower portion 6c of the rotor so that the top surface of the portion 2g of the inset member engages the lower surface of the flange.

An operating member 7 is slidably accommodated within the upper part of the holder 1 and is formed of a first cylindrical portion slidably received in the orifice at the upper end of the holder and a cylindrical lower portion of increased diameter to limit the extent of upward movement of the operating member through the said orifice. A pair of radially projecting and axially extending ribs 7a are diametrically opposed on the lower portion of the operating member and co-operate with grooves in the holder 1 to prevent rotation of the operating member. The operating member 7 is hollow, being open at its lower end but closed at its upper end, and is formed with an inner shoulder 7c at the junction of the two body portions thereof. The ribs 7a are each formed with an inclined lower surface 7b adapted to engage the inclined surfaces 6b of the rotor 6, and to increase the area of contact with the first cam surface. A coil spring 8 acts between the upper surface of the inset member portion 2g and the shoulder 7c to bias the operating member upwardly.

As indicated by the relative positions shown in Figures 6A and 6B, the ink reservoirs 4 may both be accommodated within the pen holder 1 with their writing tips spaced inwardly from the lower orifice of the holder when the rotor 6 is in such a position that the rib 5a of the cap 5 of a first of said ink reservoirs 4 is biased into engagement with

the upper part of the cam surface portion 6e and the rib 5a of the cap 5 of the other ink reservoir 4 engages the flat portion of the cam surface immediately adjacent the axially extending cam surface portion 6h. Depression of the operating member 7 when the ink reservoirs are in the said position, will cause the inclined surfaces 7b of the ribs 7a thereof to engage the inclined surfaces 6b of the rotor thereby causing the rotor to rotate. Such rotation will cause the rib 5a of the first ink reservoir 4 to follow the inclined surface 6e and thereby the said ink reservoir 4 is moved downwardly so that the writing tip thereof projects from the lowermost orifice of the pen holder. When the operating member has been depressed to its maximum extent (as shown in Figure 8) the point 5b of the rib 5a following the curved cam surface 6e will have passed the lowermost point of said surface and will be in engagement with the lowermost part of the notch surface 6f. Release of the operating member 7 will allow said member to return under the bias of coil spring 8 into its uppermost position thereby freeing the rotor to rotate further under the force of spring 3 urging following rib 5a upwardly until the end 5b of the follower rib 5a is located in the notch defined by surfaces 6f and 6g, (see Figures 7a and 9). The first of the ink reservoirs is therefore maintained in a writing position whence the pen may be used for writing with said reservoir. During said downward movement of the first ink reservoir, the rib 5a of the cap 5 of the other ink reservoir has followed the flat portion of the second cam surface and, on release of the operating member 7, is located at the uppermost part of the curved cam surface 6e (see Figure 7B). Said second ink reservoir has therefore been retained in its withdrawn position. Subsequent slight depression of the operating member 7 will cause the inclined rib edges 7b to engage the inclined cam surfaces 6b of the rotor thereby causing further rotation of said rotor. Directly the rotor commences to rotate, the rib 5a engaging with the notch follows the surface 6g to its lowermost point and is then free to return to the planar portion of the second cam surface thereby causing the ink reservoir to return to its withdrawn position. At this stage, both of the ink reservoirs are in their withdrawn positions and, if the operating member 7 is released, said reservoirs will be retained in their withdrawn positions. However, if the operating member 7 is depressed further the rib 5a of the second ink reservoir will follow the cam surface 6e thereby moving the second ink reservoir into its writing position in the same manner as previously described with reference to the first ink reservoir. It will be appreciated that subsequent complete depressions of the operating head 7 will move the ink reservoirs 4 alternately from their respective withdrawn positions to their

writing positions but if both reservoirs are required to be in their withdrawn positions slight depression of the operating head 7 will serve to permit said withdrawal.

- 5 The invention has been described above with reference to a two-coloured ball point pen but it will be apparent to those skilled in the art that a similar ball point pen may be produced containing three or more ink reservoirs permitting the ball point pen to be employed for writing with three or more colours.
- 10 In the case of the three-coloured ball-point pen, the inclined surface of the rotor is provided with three inclined surfaces 6b and the lower portion of the rotor 6c extends over
- 15 only one-third of the flange, i.e. subtends an angle of only 120°.

WHAT WE CLAIM IS:—

- 20 1. A writing instrument of the kind referred to comprising a rotor rotatably received in the holder and having a first cam surface with a profile defining, for each revolution of the rotor, a number of steps at least equal to the number of writing elements and a
- 25 second cam surface for moving, during each revolution of the rotor, the writing elements in sequence from their withdrawn to their writing positions; an operating member slidably received in the holder to engage the first
- 30 cam surface to rotate the rotor; means biasing the operating member away from the first cam surface; and means biasing the writing elements into their withdrawn positions, the arrangement being such that successive depressions of the operating member will cause the
- 35 writing elements to be presented in turn at their writing positions.

2. A writing instrument as claimed in claim 1 wherein the pen holder is elongate and essentially tubular.

3. A writing instrument as claimed in claim 2 wherein the rotor has a cylindrical body and is accommodated co-axially within the housing.

- 45 4. A writing instrument as claimed in Claim 2 or Claim 3 wherein the first cam surface is formed radially on the inner surfaces of an upper portion of the rotor, and wherein said rotor comprises a cylindrical tube.

- 50 5. A writing instrument as claimed in Claim 4 or Claim 5 wherein the first cam surface is formed of a number of surface portions inclined to the axial direction with the lowermost point of each portion axially above the uppermost point of the next portion.

- 55 6. A writing instrument as claimed in any one of Claims 2 to 5 wherein the operating member extends through the top of the hous-

ing and is movably axially with respect thereto.

7. A writing instrument as claimed in Claim 6 wherein the operating member has a radially projecting rib portion which extends axially to engage at its lower end the first cam surface.

8. A writing instrument as claimed in Claim 7 wherein the lower end of the rib portion is inclined to increase the area of contact with the first cam surface.

9. A writing instrument as claimed in any one of claims 2 to 8 wherein the second cam surface is the axially lower surface of an annular projection depending from the rotor body.

10. A writing instrument as claimed in claim 8 wherein the second cam surface is formed essentially of a first surface portion inclined to the axial direction and a second surface portion contained in the radial plane passing through the uppermost part of the first surface portion.

11. A writing instrument as claimed in claim 10 wherein a notch is formed of a convergent pair of cam surfaces adjacent the lowermost point of the first surface portion to locate a writing element in the writing position and to cause the rotor to rotate slightly on release of the operating member from engagement with the first cam surface.

12. A writing instrument as claimed in any one of the preceding claims wherein the writing elements are provided at their upper ends with caps having a portion thereof constituting a follower for the second cam surface.

13. A writing instrument as claimed in claim 12 wherein the said portion is a radially projecting and axially extending rib pointed at its upper end.

14. A writing instrument as claimed in claim 13 including an inset member having bores extending therethrough to locate the writing elements and having grooves co-operating with each of said bores to receive the ribs of the caps to prevent rotation thereof.

15. A writing instrument as claimed in any one of the preceding claims wherein the writing elements are ball point pen refills.

16. A writing instrument as claimed in claim 1 substantially as hereinbefore described with reference to, and as illustrated in, the

Figures of the accompanying drawings.

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FIG. 1

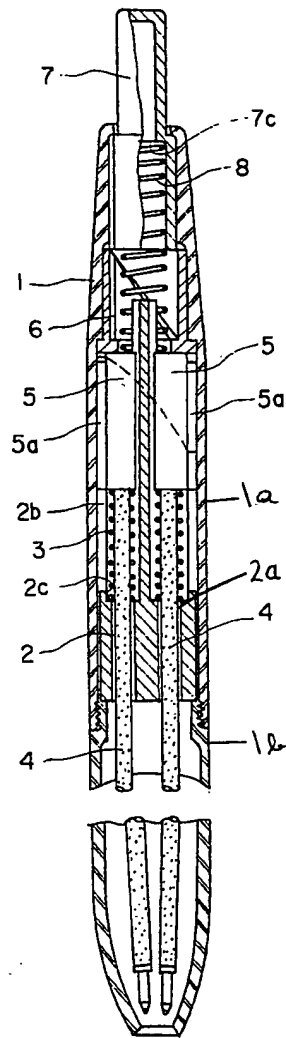


FIG. 2

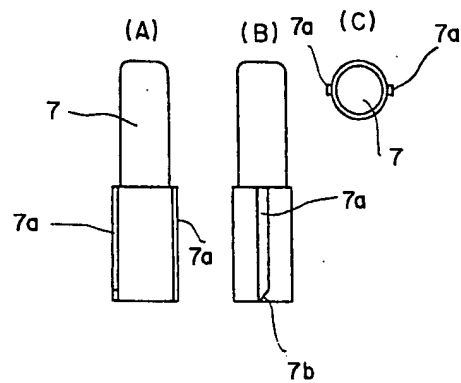


FIG. 3

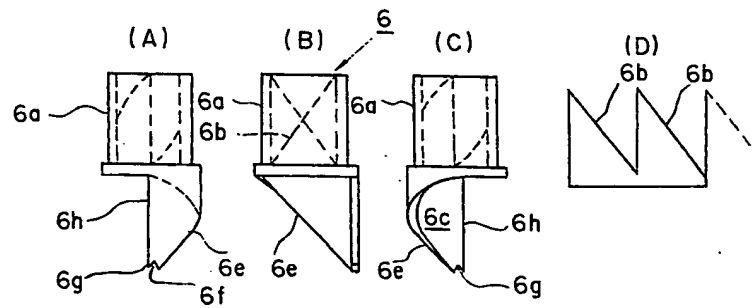


FIG. 4

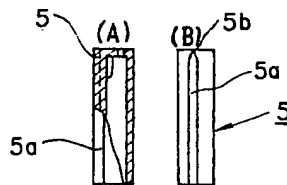


FIG. 5

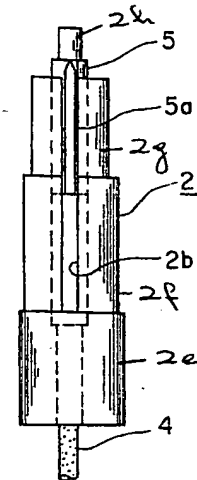


FIG. 6

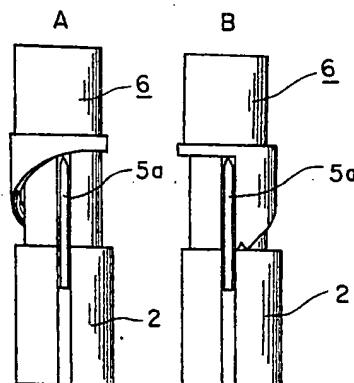


FIG. 7

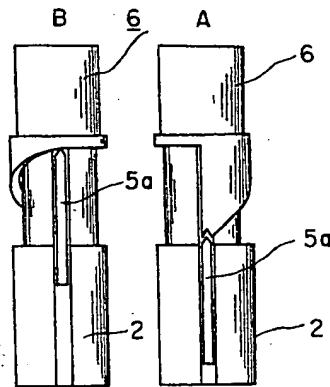
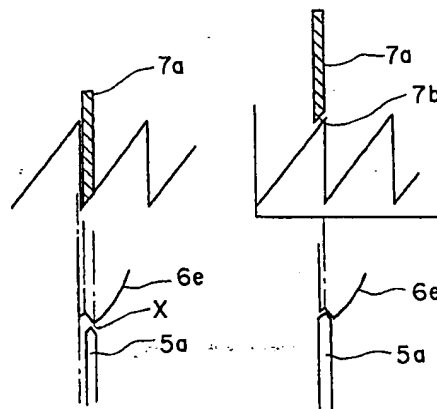


FIG. 8

FIG. 9



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